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Title	Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, (With 18 Text-figures and 2 Tables)
Author(s)	ITÔ, Tatsunori
Citation	北海道大學理學部紀要 = JOURNAL OF THE FACULTY OF SCIENCE HOKKAIDO UNIVERSITY Series . ZOOLOGY, 18(2): 305-336
Issue Date	1972-04
Doc URL	http://hdl.handle.net/2115/27531
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Type	bulletin
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Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, IV¹⁾²⁾

By

Tatsunori Itô

Zoological Institute, Hokkaido University

(With 18 Text-figures and 2 Tables)

The present paper deals with five new species of marine harpacticoid copepods from Hokkaido, belonging to the different genera as *Parathalestris* Brady et Robertson (Thalestridae), *Amphiascus* Sars (Diosaccidae), *Stenocaris* Sars and *Paraleptastacus* C. B. Wilson (Cylindropsyllidae), and *Arenosetella* C. B. Wilson (Ectinosomidae). All the genera except for the first one have not been so far recorded from Japan. The species of the latter three genera are reported as the new members of the interstitial fauna from Hokkaido.

The specimens examined were collected from Rumoi, Ishikari and Oshoro on the Japan Sea coast, Hakodate on the Tsugaru Straits and Akkeshi on the Pacific coast. All the type specimens are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

Before going further, the author wishes to express his cordial gratitude to Prof. Mayumi Yamada, Zoological Institute, Hokkaido University for his kind guidance to the present study and reading the manuscript.

Parathalestris areolata n. sp.

(Figs. 1-4)

Female. Length about 2.5 mm, rostrum and furcal setae excluded. Body (Figs. 1-1, 1-2) reddish brown in colour, slightly tapering posteriorly, more or less areolated dorsally and laterally; ventral surface of all somites except for posterior one of genital double-somite never areolated. Posterior edges of all body segments except for anal one furnished with some projections. Cephalic segment about as long as succeeding four segments combined, and about 1.5 times as long as greatest height, with some delicate hairs on dorsal surface and posterior edge; both lateral hind edges slightly produced posteriorly. Rostrum (Fig. 2-3) clearly defined at base, triangular in shape, with a pair of sensory setae on a small protuberance in each; apical part slightly bifid. Genital double-somite (Fig. 1-3) clearly divided

1) Contribution No. 921 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Studies on marine harpacticoid copepods from Hokkaido, V.

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 18(2), 1972.

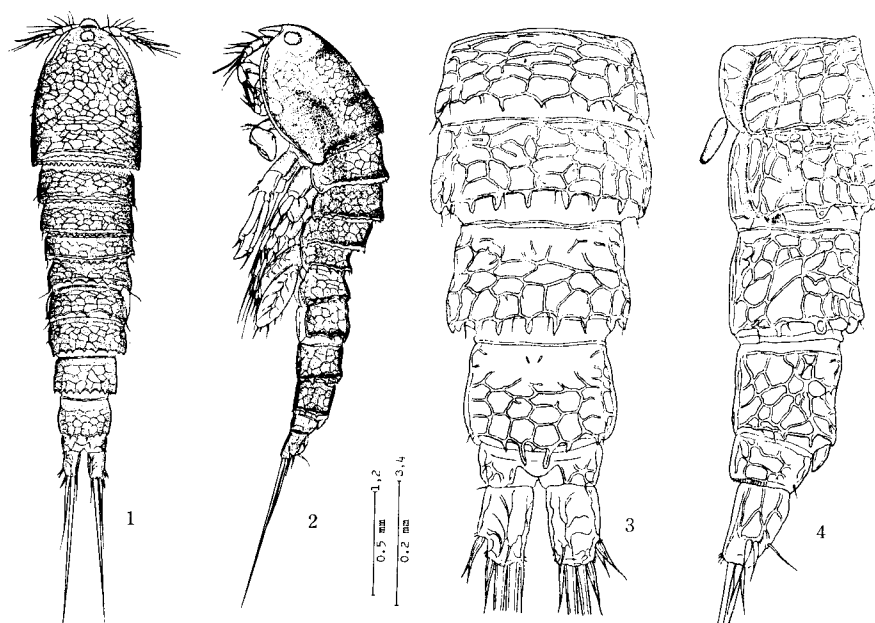


Fig. 1. *Parathalestris areolata* n. sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, abdomen, dorsal; 4. ♀, abdomen, lateral.

into two segments; each ventro-lateral edge of posterior segment with a small serrated protuberance; genital area as shown in the figure (Fig. 2-1). Penultimate somite about half as wide as cephalic segment, furnished with a pair of well-developed protuberances on dorsal posterior edge, and a transverse spinular row on ventral surface near posterior edge. Antepenultimate somite with a setula on both lateral corners near ventro-posterior edge. Anal segment short, with many spinules along ventral and lateral posterior edges, and one setula on each dorsal edge near posterior end. Anal operculum bare and half-rounded in shape. Furcal ramus (Fig. 1-3) 1.5 times as long as greatest width; dorsal part upheaved longitudinally, tapering posteriorly in lateral view; a short seta on dorsal edge near end of upheaval, two juxtaposed spines or short setae accompanied with several spinules on outer subdistal corner; principal inner terminal seta about as long as abdomen except for furcal ramus; one thick and one slender short setae on outer and inner terminal corners, respectively.

Antennule (Fig. 2-2) nine-segmented; first segment with one seta near anterior distal edge, and some spinules along anterior edge; fourth one furnished with one aesthetasc about twice as long as apical five segments combined; apical five segments remarkably slighter than others; sixth one 1.5 times as long as fifth; ninth one with one small aesthetasc. *Antenna* (Fig. 2-4). Coxa very short.

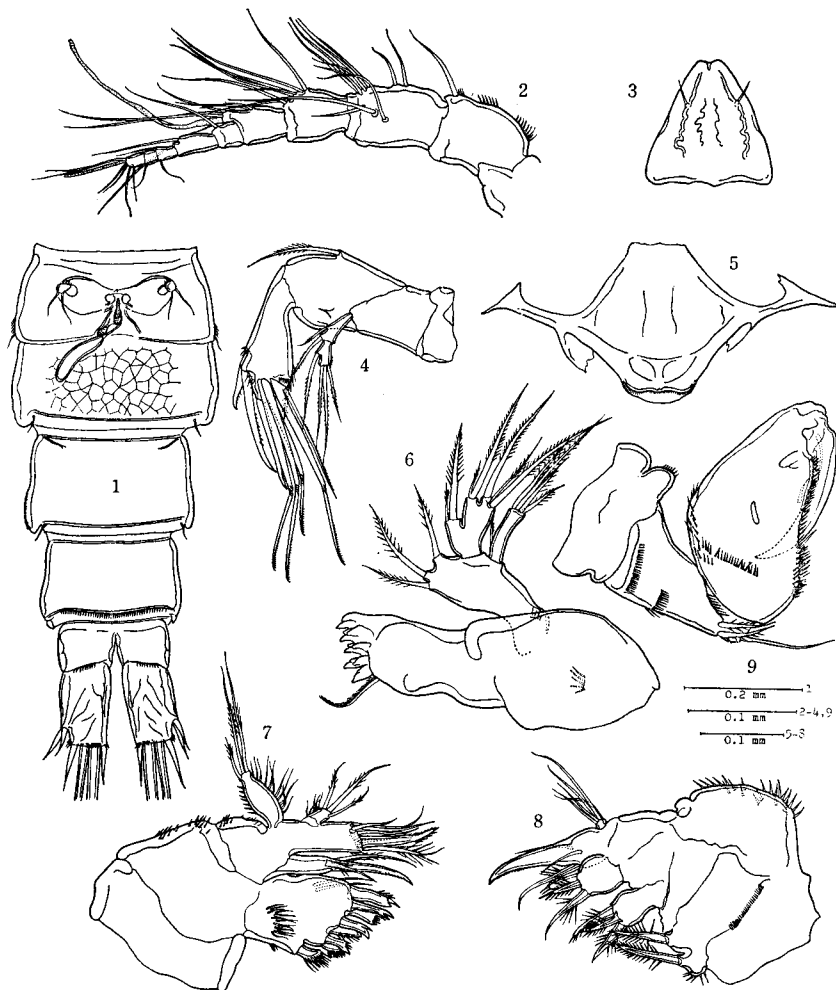


Fig. 2. *Parathalestris areolata* n. sp. 1. ♀, abdomen with a spermatophore, ventral. 2. ♀, antennule; 3. ♀, rostrum; 4. ♀, antenna; 5. ♀, labrum; 6. ♀, mandible; 7. ♀, maxillula; 8. ♀, maxilla; 9. ♀, maxillipede.

Allobasis obliquely subdivided into two parts by an obscure suture, with one hairy seta on anterior middle edge of distal part. Exopodite two-segmented; first segment thickened distally, with two hairy setae distally and subdistally; second one a little shorter than first, with one marginal and three terminal hairy setae. Endopodite with three claws and four geniculate spines, one of which having a common base with one slender hairy and one short setae; all claws and spines more or less pectinated; several spinules near base of spines. Labrum (Fig. 2-5) with a

row of many delicate spinules or hairs near distal margin which slightly rounded and bare. *Mandible* (Fig. 2-6). Praecoxa with bidentate pars incisiva, tridentate lacinia mobilis, three spines and one hairy seta along cutting edge; pars molaris rather moderate; several spinules on subproximal surface. All setal number and situation of coxa-basis, exopodite and endopodite identical with those of *Parathalestris verrucosa* Itô (1970), but all setae thicker and spinulose. *Maxillula* (Fig. 2-7). Praecoxa with many spinules on and near outer edge; arthrite with two bare parallel setae near middle ventral edge, some thick hairs on surface and several spinules on middle dorsal edge; inner edge with seven spines which more or less spinulose and complicated in various ways; one spinulose spine on dorsal corner. Inner projection of coxa a little shorter than arthrite of praecoxa, with one pectinate claw and three spinulose setae; outer rim spinulose. Basis with many spinules near inner end, one pectinate claw and six setae, one of which spinulose, on inner end. Exopodite about twice as long as greatest width, with two hairy terminal setae; one short seta on subdistal outer corner; inner margin hairy and outer one spinulose. Endopodite small, about a third as long as exopodite-segment, with two terminal and one inner subterminal setae; outer margin hairy. *Maxilla* (Fig. 2-8). Syncoxa with an oblique spinular row on surface, many strong spinules on and near outer margin, and furnished with three endites; first endite much widened and bilobate, each lobe with one thick spinulose seta, and less number of spinules on dorsal margin of proximal lobe; second and third endites with three spinulose thick setae on each inner end. Basis forming one pectinate strong claw accompanied with three setae, dorsal one longest and spinulose and other two bare. Endopodite very small, distinctly separated at base, with five bare setae. *Maxillipede* (Fig. 2-9). Coxa short and much widened, with several spinules on outer edge. Basis clearly tapering distally, with one bare and two spinulose setae on distal end and subdistal edge, respectively; three spinular rows transversely or obliquely. Endopodite a little longer than proximal two segments combined; inner margin slightly concave, with many spinules and two short setae; outer margin moderately convex; one (or two) transverse spinular row on subproximal surface; one strong claw two-thirds as long as basis, accompanied with one short seta basally.

Leg 1 (Fig. 3-1). Free edge of intercoxal plate moderately convex and bare. Coxa a little shorter than width; outer part of anterior surface furnished with two longitudinal spinular rows, inner one of which reaching to suture between coxa and basis and outer one situated just inside of slightly convex outer margin with many spinules. Basis shorter than coxa, widened distally; inner proximal corner of anterior surface with several hairs; inner and outer spines thick and spinulose; some spinules on middle inner edge, just outside of inner spine and near base of outer spine. Exopodite about 2.5 times as long as basis; first segment small, with one spinulose spine near outer subdistal edge and some spinules along outer margin; second one 3.5 times as long as first, with one outer spine, minutely spinulose, on three-fifths the length of spinulose outer margin, and one spinulose seta on inner subdistal

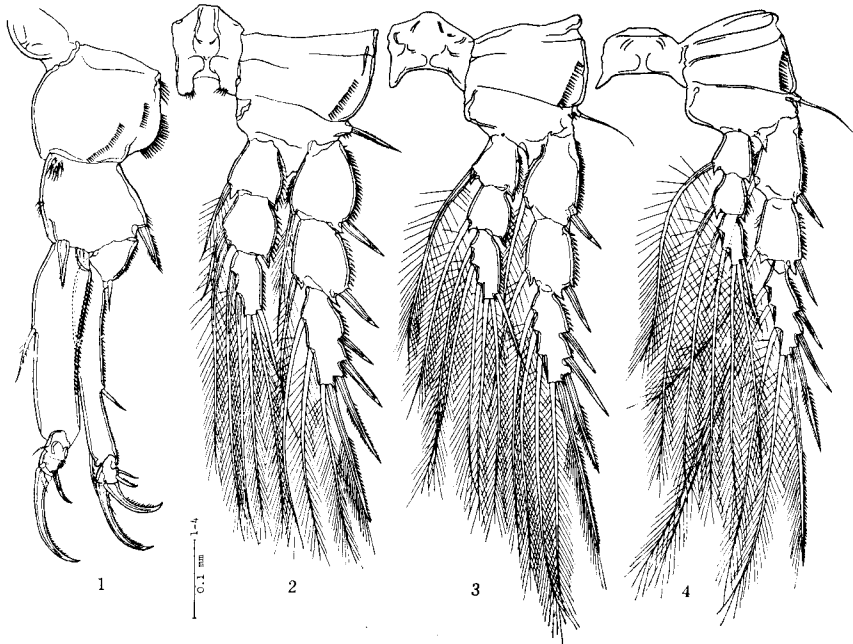


Fig. 3. *Parathalestris areolata* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4.

edge; third one about half as long as first, with two short outer spines, distal one spinulose, two pectinate strong claws, inner one 1.5 times as long as outer and accompanied with a bare setula basally, on distal end. Endopodite little shorter than exopodite, but much thicker than latter; first segment 3.5 times as long as greatest width, with one spinulose inner seta and many spinules along outer margin; second one small and with one bare setula on distal inner edge; third one as long as second, furnished with two pectinate claws, shorter one on subdistal outer corner and another one very lobust, about three times as long as shorter one and distinctly longer than inner terminal claw of third exopodite-segment, and two bare setulae, each situated near middle inner edge and on inner base of terminal claw; outer margin spinulose. *Leg 2* (Fig. 3-2). Free edge of intercoxal plate deeply concave in a rectangle, and with several spinules on both edges. Coxa widened and outer edge about 1.5 times as long as inner, a longitudinal spinular row on anterior surface near outer margin. Basis forming a lameller projection between both rami, with one spinulose outer spine or spiniform seta. All setal and spinal structures almost same as in *P. verrucosa*. Outer terminal spine of third exopodite-segment about 1.5 times as long as segment. Distal end of endopodite-segment reaching to basal part of proximal inner seta of third exopodite-segment. *Leg 3* (Fig. 3-3). Free edge of intercoxal plate widely

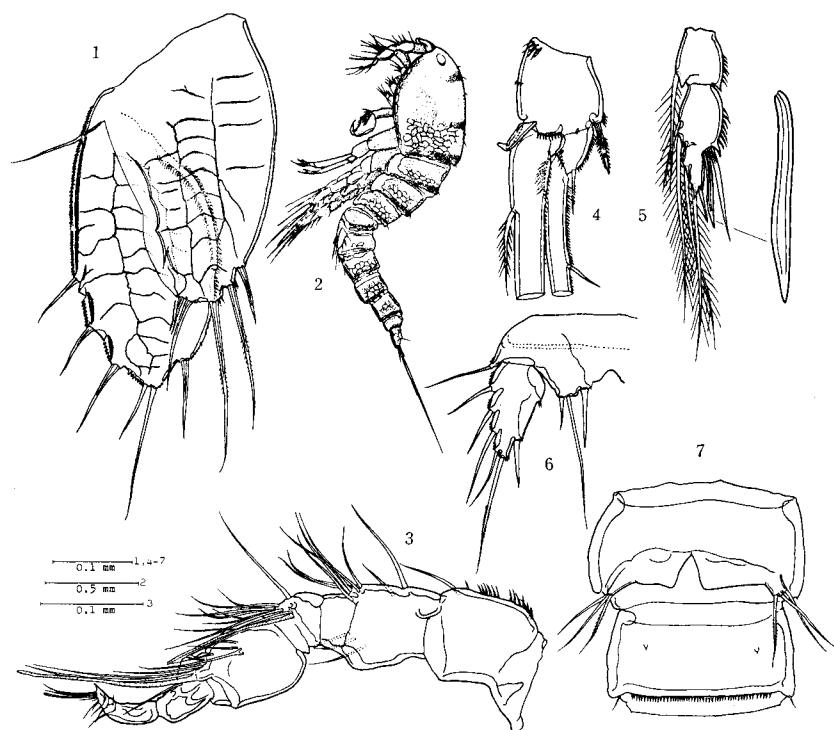


Fig. 4. *Parathalestris areolata* n. sp. 1. ♀, leg 5; 2. ♂, lateral; 3. ♂, antennule; 4. ♂, leg 1; 5. ♂, endopodite of leg 2; 6. ♂, leg 5; 7. ♂, leg 6.

concave, without any spinules. Outer terminal spine of third exopodite-segment about twice as long as segment. Third endopodite-segment a little longer and slender than preceding segment; outer subterminal spine hairy and well-developed. *Leg 4* (Fig. 3-4). Free end of intercoxal plate concave in a low trapezoid. Both rami slighter than in preceding leg. Outer terminal spine of third exopodite-segment more than twice as long as segment. Endopodite little shorter than proximal two exopodite-segments combined. *Leg 5* (Fig. 4-1) well-developed, foliaceous. Distal end of basoendopodite reaching to a third the length of exopodite; outer margin slightly concave and hyaline; bare outer seta on a spinulose projection situated on outer proximal base; five setae along distal edge, outermost one shortest and contiguous to next seta, and middle one longest. Exopodite oval in form, spinulose marginally, and furnished with six setae in total, distal two setae contiguous to each other and apparently more slender than others. *Leg 6* (Fig. 2-1) represented by a small segment with two minor setae situated on outer part of genital area.

Male. Body (Fig. 4-2) about 1.9 mm in length, paler than female in colour.

Areolate pattern of all segments rather obscure. All abdominal segments spinulose along ventral posterior edge. *Antennule* (Fig. 4-3) haplocer and lobust in appearance; third, fourth and apical segments, each with one aesthetasc.

Leg 1 (Fig. 4-4). Apical part of inner spine of basis twisted outwards. Exopodite spinulose on inner part of first segment and inner proximal margin of second one. *Leg 2* (Fig. 4-5). Endopodite two-segmented; first segment with one plumose inner seta near base of a small spinous projection; distal half of second segment distinctly narrowed; apical part clearly sharpened; four plumose setae, proximal one distinctly shorter, along inner margin, two strong bare spines on outer corner of proximal half, and one relatively small spine, which accompanied with several minor spinules basally, on outer subdistal edge. *Leg 5* (Fig. 4-6). Both basoendopodites forming into a bilobate common plate; each lobe with one spiniform seta on inner subdistal edge and two setae, inner one much longer, on distal edge. Exopodite distinctly tapering apically, with several spinules on a third the length of inner edge, one spiniform seta on subdistal inner edge, one terminal and four outer marginal setae, of which subterminal one slender; outer margin spinulose. *Leg 6* (Fig. 4-7). Basoendopodite and exopodite confluent and forming a plate, outer part of which produced obliquely outwards; one hairy and two bare setae on distal end.

Remarks. The present species somewhat resembles *Parathalestris ganio* Brehm (1938) from Chile in the furcal ramus with chitinous dorsal ridge, the maxillipede and the structure of claws of the leg 1, but is easily distinguishable from the latter in the leg 5 and in several another structures. In the latter species the basoendopodite of leg 5 is remarkably bigger than the exopodite, and the outer edge of furcal ramus is not furnished with two spines but with one spine (or seta), and moreover the exopodite of leg 5 in the male is distinctly furnished with one inner seta on middle edge. The present species is also similar to *P. californica* Lang (1965) from California particularly in the legs and the proportion of furcal ramus, but differs from the latter in the ornamentation of the carapace and especially in the pseudopericulum.

The structure of oral appendages of the majority of the *Parathalestris*-species has not yet been reported in detail. Such structure has been so far clarified in only three species, namely, *P. bulbiseta* Lang (1965) and *P. californica* Lang (1965), both from California and *P. verrucosa* Itô (1970) from Akkeshi, Hokkaido. The structure has been often neglected by many authors probably because of the difficulty to study, but it seems to the author that it is apparently of unnegligible taxonomic value as in another appendages. For instance, the setal number as well as its situation of the mandible in *P. verrucosa* is in accord with those in *P. areolata*, but the setae in the former are hairy against spinulose in the latter; the exopodite of maxillula is furnished with three setae in *P. verrucosa* as well as *P. areolata* but with two setae in *P. californica*.

Type-specimens. Syntypes. 2 ♀♀ and 2 ♂♂, 21-VI-'71. All the specimens were collected from Oshoro by rinsing algae in intertidal zone.

***Amphiascus elongatus* n. sp.**

(Figs. 5-10)

Female. Body (Figs. 5-1, 5-2) rather depressed laterally, about 1.3 mm in length, rostrum and furcal setae excluded, and 0.16 mm in greatest width, colourless and semitransparent. Hyaline membrane of each body segment moderate. Cephalic segment twice as long as greatest width, and about as long as three succeeding somites combined. Nauplius eye present. Rostrum (Fig. 6-1) well-developed, elongate triangular in shape, about twice as long as first antennular segment and furnished with a pair of fine sensory setae on about two-thirds the length of dorsal surface near edge. Genital double-somite (Fig. 5-3) indistinctly subdivided by a chitinous stripe laterally, with several spinules transversely on just anterior part of chitinous stripe and near posterior end; ventral posterior edge without any spinules; genital area as shown in the figure (Fig. 5-5). Antepenultimate and penultimate somites with some spinules dorsally and laterally near posterior edge but without ventrally. Anal segment with a spinular row on dorsal surface a little behind of operculum, and one setula on both dorsal

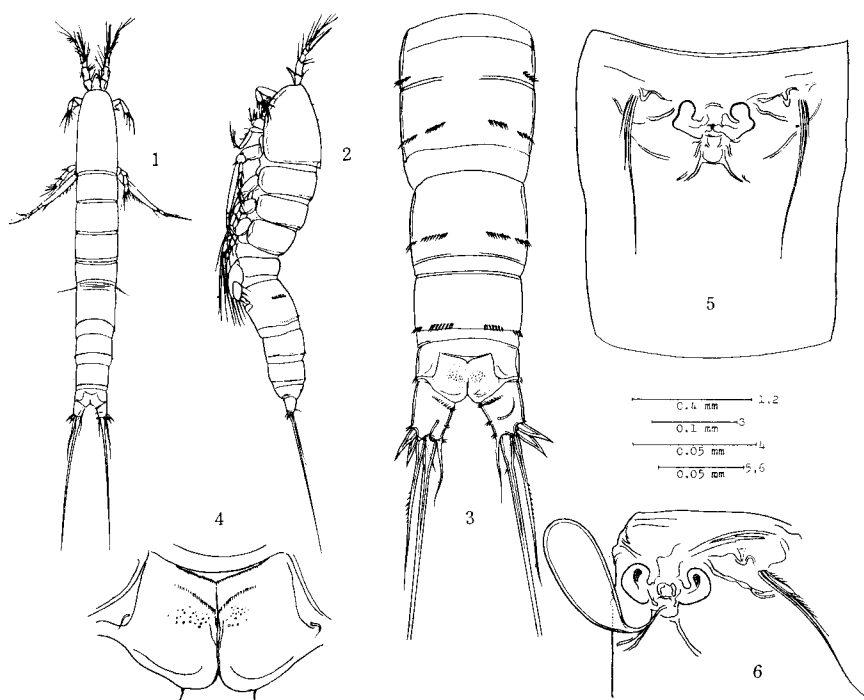


Fig. 5. *Amphiascus elongatus* n. sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, abdomen, lateral; 4. ♀, anal operculum; 5. ♀, genital area; 6. ♀, genital area with a spermatophore.



Fig. 6. *Amphiscus elongatus* n. sp. 1. ♀, rostrum and antennule; 2. ♀, antenna; 3. ♀, mandible; 4. ♀, maxillula; 5. ♀, maxilla; 6. ♀, maxillipede.

posterior corners. Anal operculum thin and hyaline. Furcal ramus (Fig. 5-3) a little longer than width, slightly tapering posteriorly, furnished with a transverse spinular row on inner part near anterior end, one bare seta, which geniculate at base on middle dorsal surface; several spinules on inner edge near dorsal seta; two thick outer spines on subdistal corner; distal end with two principal terminal setae, both swollen basally, and two bare setae, each on ventral edge and inner corner.

Antennule (Fig. 6-1) eight-segmented, tapering apically; first segment with one seta and a spinule near anterior distal corner; second one with one setula on subdistal posterior edge; fourth one furnished with one aesthetasc which reaching to distal end of apical segment; apical four segments almost equal in length; eighth one with one short aesthetasc terminally. *Antenna* (Fig. 6-2). Coxa short and bare. Allobasis about three times as long as greatest width, with one setula on middle anterior edge. Exopodite situated on a third the length of allobasis, three-segmented; first segment a little thickened distally, with one hairy seta on distal corner; second one shortest, with one hairy seta; third one about half as long as first, with one marginal seta on subdistal edge, and a spinule and three short setae, one of

which rather spiniform and spinulose, on distal end. Endopodite about two-thirds as long as allobasis; anterior margin spinulose, two strong spines along subdistal anterior edge; one arched strong spine, four geniculate long spines, posterior one bifurcate basally, and one bare seta on distal end; an oblique spinular row near subdistal posterior corner. *Mandible* (Fig. 6-3). Praecoxa with tridentate pars incisiva, lacinia mobilis, three thick spines, three small spines and one spinulose seta. Coxa-basis widened distally, with some hairs along dorsal margin, several spinules at base of endopodite, one spinulose and two hairy setae on distal end. Exopodite very small, indistinctly two-segmented; each segment with one bare seta. Endopodite about half as long as coxa-basis, with two juxtaposed setae on a lobule situated on about middle inner edge; five bare setae on distal end. *Maxillula* (Fig. 6-4). Arthrite of praecoxa with two parallel hairy setae on surface, six spines on inner end, one spine and two spinulose setae on dorsal corner, and one spinule on dorsal proximal edge. Coxa with two hairy setae terminally. Basis much elongated inwards, with one spiniform, one long bare and one plumose setae distally, one slender bare seta subdistally, and one bifurcate bare seta on ventral subdistal edge. Exopodite very small, with two bare setae. Endopodite rather developed, somewhat inclined inwards, with four terminal setae, one of which much longer than others. *Maxilla* (Fig. 6-5). Syncoxa somewhat spinulose on middle outer edge, furnished with three endites; proximal endite with two hairy setae terminally and one spinulose seta on subdistal corner; middle and distal endites each with two and three spinulose setae, respectively. Basis forming into a strong claw accompanied with one slender bare and one thick spinulose setae. Endopodite represented by a small protuberance with six setae in total. *Maxillipede* (Fig. 6-6) remarkably slender in appearance than of other so far known species. Coxa about 1.5 times as long as greatest width, with three spinulose inner setae distally or subdistally; three transverse spinular rows near inner edge. Basis well elongated and slightly tapering distally, more than twice as long as coxa, furnished with two slender bare inner setae; several long hairs or spinules directed inwards near inner margin. Endopodite slightly widened distally, furnished with one strong terminal claw which a little shorter than basis, accompanied with two bare long setae at base; two bare setae on subdistal corner.

Leg 1 (Fig. 7-1). Coxa somewhat inclined inwards, a little longer than width, with an oblique spinular row on anterior surface near outer distal corner. Inner half of basis produced distally; several spinules on inner subproximal edge, near base of outer and inner spines and exopodite; outer spine much smaller than inner, both spinulose. Exopodite three-segmented; first segment with one outer spine on subdistal edge and many spinules along outer margin; second one longer than first and with one outer spine, one hairy inner seta and several well-developed hairs along inner margin; third one shortest, with three bare spines along outer margin, two long geniculate spines on distal end and subdistal inner corner in each, inner one hairy at middle. Endopodite well-developed, three-segmented; first segment about eight times as long as greatest width, with many hairs along

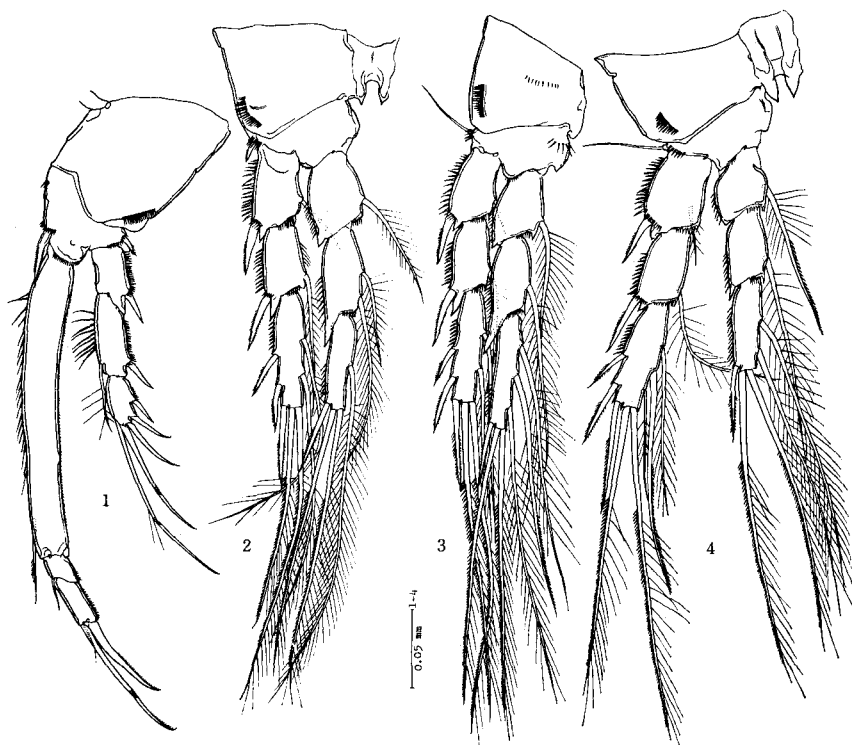


Fig. 7. *Amphiascus elongatus* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3. 4. ♀, leg 4.

inner margin and one hairy seta on subdistal inner edge; second one shortest, with one bare seta on inner distal end; third one about twice as long as second, and furnished with two pectinate claws, inner one longer and geniculate, and one bare seta on distal end; outer margin of all segments spinulose. Leg 2 (Fig. 7-2). Intercoxal plate deeply concave. Coxa with an arched spinular row on anterior surface near outer subdistal margin. Basis with one short outer spine accompanied with several spinules basally; several minute spinules between both rami. Exopodite; first and second segments, each equal in length, forming into a spiniform projection at outer distal end and with one strong outer spine and one plumose inner seta, anterior distal edge spinulose; several hairs along inner margin of second segment; third one with three outer marginal spines, two plumose inner marginal setae, and two terminal setae, both spinulose outwards and hairy inwards; outer margin of all segments spinulose. Endopodite about as long as exopodite; first segment broad, with one plumose inner seta subdistally, and several spinules on inner part of distal edge; second one forming into a distinct spiniform projection at outer distal corner, with two plumose inner setae; third one with one outer spine on subdistal

corner, two terminal setae, and one plumose seta on middle inner edge; outer margin of all segments spinulose. *Leg 3* (Fig. 7-3). Coxa with an arched spinular row on middle anterior surface transversely. Basis with one bare outer seta and several slender spinules near inner edge. Exopodite ornamented as in leg 2. Second segment of endopodite with one inner seta; third one a little longer than in leg 2, and with three inner marginal setae, one of which slightly thicker than other setae. *Leg 4* (Fig. 7-4). Third exopodite-segment with three inner marginal setae, middle one of which thickest and distal one slender. Endopodite shorter than exopodite; spiniform projection of second segment rather moderate; third one with two inner marginal setae. *Leg 5* (Fig. 10-1). The structure of inner marginal setae of basoendopodite is much variable between different specimens and even between the both legs in one specimen. Such variable structure will be described in detail and discussed in the latter page. Basoendopodite a little longer than basal width, with two terminal setae on inner expansion which forming into a small spiniform projection at outer distal corner and spinulose along outer margin; inner margin without any hairs or spinules except for marginal setae. Exopodite oval in form, reaching to distal end of inner expansion of basoendopodite, furnished with one inner subdistal, one terminal and four outer marginal setae, terminal one longest, distalmost one in outer setae remarkably slender and outer proximal one rather spiniform; both inner and outer edges with several spinules. *Leg 6* (Fig. 5-5) represented by three slender setae on genital double-somite.

Male. Body about 1.14 mm in length. First and second abdominal segments with some spinules along ventro-posterior edge; third one bare ventrally; anal one somewhat spinulose ventrally near base of furcal ramus. *Antennule* (Fig. 8-1) haplocer, ten-segmented; fourth and last segments, each furnished with one aesthetasc.

Leg 1 (Figs. 8-2, 8-3). Basis furnished with three spiniform projections, one of which angled posteriorly, on middle inner edge, and one small protuberance near proximal inner edge. *Leg 2* (Fig. 8-4). Endopodite two-segmented, first segment with one plumose seta on middle inner edge and a short spiniform projection of inner subdistal edge; second one about twice as long as first, furnished with two strong mucroniform processes on outer subdistal corner, one bare terminal seta thickened basally and three plumose inner marginal setae, proximal one shortest and situated on a small protuberance; outer margin of both segments spinulose. *Leg 5* (Fig. 8-7). Both basoendopodites fused at inner proximal half; outer distal corner forming into a spiniform projection; two hairy thick setae on distal end; outer margin spinulose. Exopodite with two hairy inner setae, one long bare seta on a lobule terminally, and three spines along outer edge. *Leg. 6* (Fig. 8-9) represented by a wide plate with three setae, innermost one somewhat hairy, on outer end.

Preadult stage (the fifth copepodid), female. The present stage is presumably of the fifth copepodid judging from the structure in the antennule or thoracic legs.

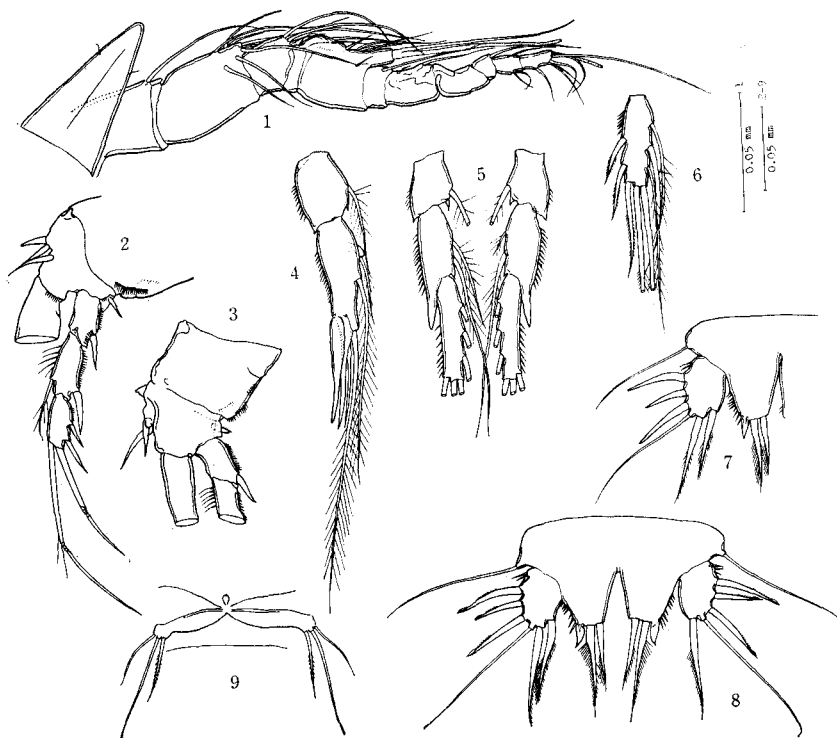


Fig. 8. *Amphiascus elongatus* n. sp. 1. ♂, rostrum and antennule; 2. ♂, leg 1; 3. ♂, basal segment of leg 1; 4. ♂, endopodite of leg 2; 5. ♂, a pair of endopodites of leg 3; 6. ♂, third exopodite-segment of leg 4; 7. ♂, leg 5; 8. ♂, leg 5 with an abnormal exopodite; 9. ♂, leg 6.

Body 0.94 mm in length. Abdomen consisting of four segments. *Antennule* eight-segmented. Anterior edge of allobasis of *antenna* not ornamented. *Leg 1* to *leg 4* as shown in the figure (Figs. 9-1 to 4), all identical with those of adult described in the segmentation and the ornamentation, but a little thicker than of the adult in appearance. *Leg 5* (Fig. 10-6). All segments confluent. Inner expansion furnished with four inner marginal setae without any exception in seven specimens examined, but the second seta in three ones more or less dwarfed (Fig. 10-7).

Variability. In a male, the third segment of leg 1 is furnished with two outer spines instead of three in one of a pair (Fig. 8-2). The exopodite of leg 5 in the same specimen is furnished with one inner seta instead of two (Fig. 8-8). In another male, proximal inner seta of the second endopodite-segment of leg 3 is remarkably dwarfed (Fig. 8-5).

The basoendopodite of leg 5 in female is much variable in the setal structure

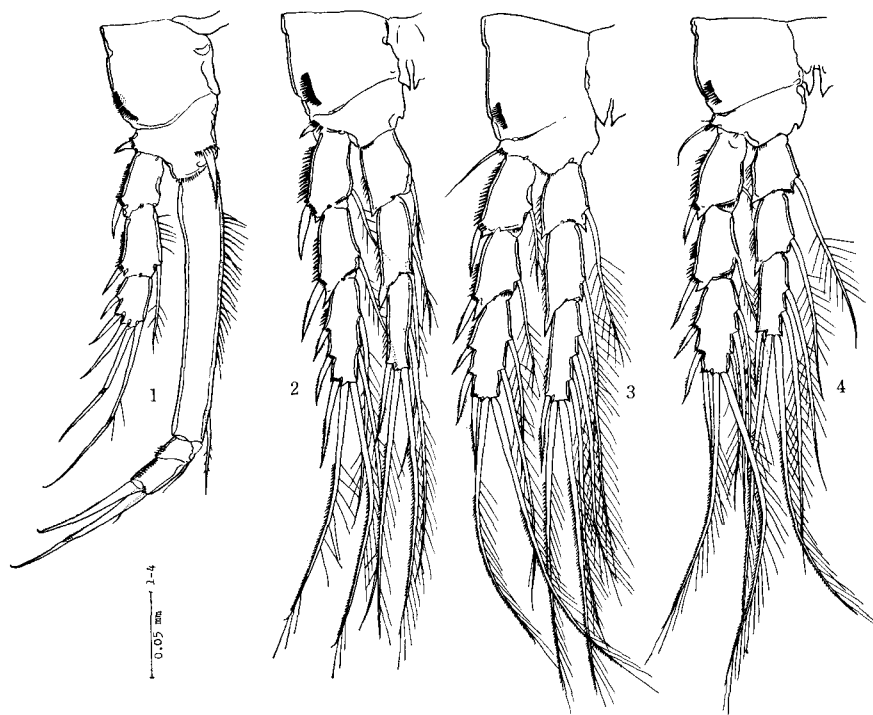


Fig. 9. *Amphiascus elongatus* n. sp. Preadult stage. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4.

as already described. There are two major types in the ornamentation of inner margin. The two types are distinguished from each other by the three and the four inner setae. Two specimens dissected have the asymmetrical leg 5 which is furnished with three and four inner setae in right and left respectively in one specimen (Fig. 10-5), and in reverse in the other one which is here unillustrated.

On the other hand the three-setae-type is divisible into two forms, in one of which the proximal two setae are widely separated from each other (Fig. 10-2) and in the other form the three setae are set on same interval (Fig. 10-1, only the right leg is corresponding to the present form, and the main description of the species was based on this specimen).

The three-setae-type seems to be derived secondarily from the four-setae-type. It is certifiable with the following reasons: 1), the absence of the second seta (counting distally) in the four-setae-type brings presumably the three-setae-type with two widely separated setae; 2), the second seta of preadult copepodid stage is often noticeably dwarfed and in such specimens the other setae are always normal. Such difference in the leg 5 is summarized in the table (Tab. 1) particularly con-

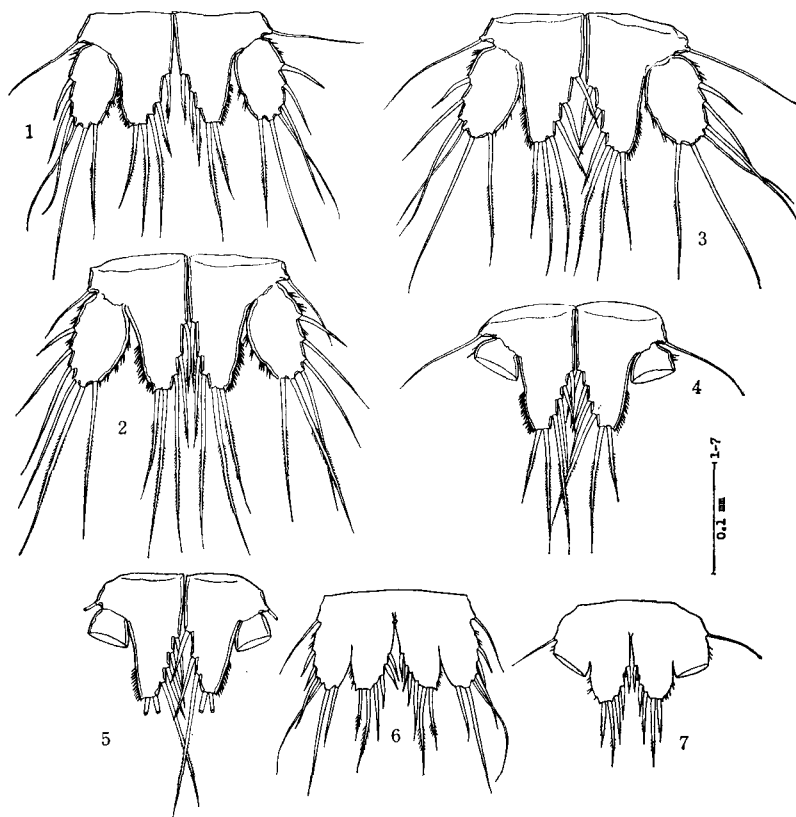


Fig. 10. *Amphiascus elongatus* n. sp. Explanation in text. 1-5. ♀, leg 5; 6 and 7. ♀, leg 5 in preadult stage.

Table 1. The condition of the second inner marginal seta on the basoendopodite of leg 5 in females. Each letter represents the number of individuals corresponding.

The specimens with asymmetrical legs in the setal number are shown in parentheses counted as 0.5 per specimen.

The 5th cop., ♀	normal	dwarfed	total
	4	3	7
The adult, ♀	present	absent	total
	2(1)	2(1)	6

cerning the second seta.

Such variable nature in the number of setae has been already known in *A. minutus* (Claus, 1863). *A. sexsetatus* with six setae on the basoendopodite

reported by Monard (1928) from Banyuls, France, was regarded as a mere variety of *A. minutus* with five setae by Lang (1948).

Remarks. The present species apparently belongs to the *varians*-group in the setal structure of the endopodite of leg 3 and the exopodite of leg 1 (see Lang, 1948), and remarkably differs from all the species within the genus in the slender maxilliped.

The furcal ramus of the present species well resembles that of *A. ampullifer* (Humes, 1953; the taxonomic status of the species was already discussed by Lang, 1965) which was obtained from the mouthparts of the American lobster, *Homarus americanus* Milne-Edwards. The inner expansion of leg 5 of the present species is furnished with both five and six setae, while with five setae in all so far known species of the group. The leg 5 of male is very similar to that of *A. minutus calcaratus* Willey (1935) from Bermuda.

The present species described is the second member of the commensal harpacticoids from Japan. The first report by Pearse (1930) is on *Cancerincola wilsoni* which was collected on the gills of two crabs, *Sesarma haemotocheir* (de Haan) and *Sesarma pictum* (de Haan).

Type-specimens. Syntypes. 6 ♀♀ and 3 ♂♂, 7-VII-'70. All the specimens were obtained on the gills of the crab, *Telmessus cheiragonus* (Tilesius) collected from Akkeshi. A number of additional specimens were also collected from the same locality (5-VII-'71) and some of them were ovigerous and apparently of several younger stages. The preadult stage described were based mainly on such specimens.

***Paraleptastacus unisetosus* n. sp.**

(Figs. 11-12)

Female. Body (Fig. 11-1) cylindrical, about 0.4 mm in length, colourless and transparent. Nauplius eye wanting. Rostrum (Fig. 11-2) rather moderate, triangular in shape. Cephalic segment about as long as second succeeding somites combined, rectangular in shape in both lateral and dorsal views, scattering some delicate sensory setae. Genital double-somite with no trace of subdivision, and genital area ornamented as in the figure (Fig. 12-6). Ventro-posterior edge of anal segment spinulose. Anal operculum moderately rounded, with some spinules on both lateral hind edges. Furcal ramus (Fig. 12-7) almost as long as anal segment, forming into a spiniform projection arched dorsally at posterior end and furnished with two bare setae on dorsal or subdorsal edge; one slender seta bifurcate apically on inner edge; several spinules on dorsal edge near dorsal setae and on inner edge; two juxtaposed setae, so-called principal terminal setae, and a hair on outer base of spiniform projection. Labrum (Fig. 11-4) well-developed and spinulose; distal edge slightly concave.

Antennule (Fig. 11-2) slender in appearance, seven-segmented; first segment short and bare; second one about three times as long as first; fourth one furnished with one aesthetasc; seventh one 1.5 times as long as preceding one and with one trifurcate terminal seta, one of the furcations aesthetase-like. *Antenna* (Fig. 11-3).

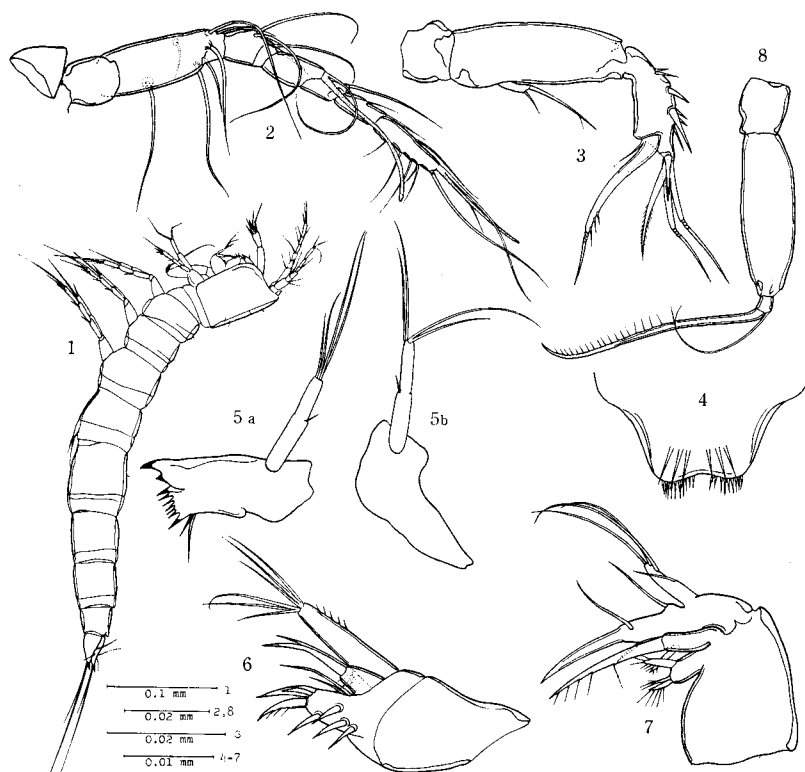


Fig. 11. *Paraleptastacus unisetosus* n. sp. 1. ♀, lateral; 2. ♀, rostrum and antennule; 3. ♀, antenna; 4. ♀, labrum; 5 a and b. ♀, mandible; 6. ♀, maxillula; 7. ♀, maxilla; 8. ♀, maxillipede.

Coxa short and bare. Allobasis more than three times as long as coxa and without any spinules or hairs. Exopodite about as long as coxa, attaching to subproximal edge of allobasis, one-segmented, and furnished with one terminal seta bifurcated apically and one short subterminal seta. Endopodite about two-thirds as long as allobasis; anterior margin spinulose and with two bare spines; distal end with one strong geniculate and spinulose spine bifurcate basally, one hairy thick seta, one hairy short spine and two bare geniculate spines. *Mandible* (Figs. 11-5a,b). Praecoxa with bidentate pars incisiva and seven spines on cutting edge, one seta and one spine on dorsal corner. Palp cylindrical, indistinctly two-segmented; first segment with a short seta; second one with a pair of two juxtaposed setae terminally. *Maxillula* (Fig. 11-6). Arthrite of praecoxa furnished with a couple of parallel setae near middle ventral edge; four spines or claws, dorsal one pectinate, on inner edge, four spines on and near dorsal edge. Coxa rather moderate, with one arched claw and one seta on inner end.

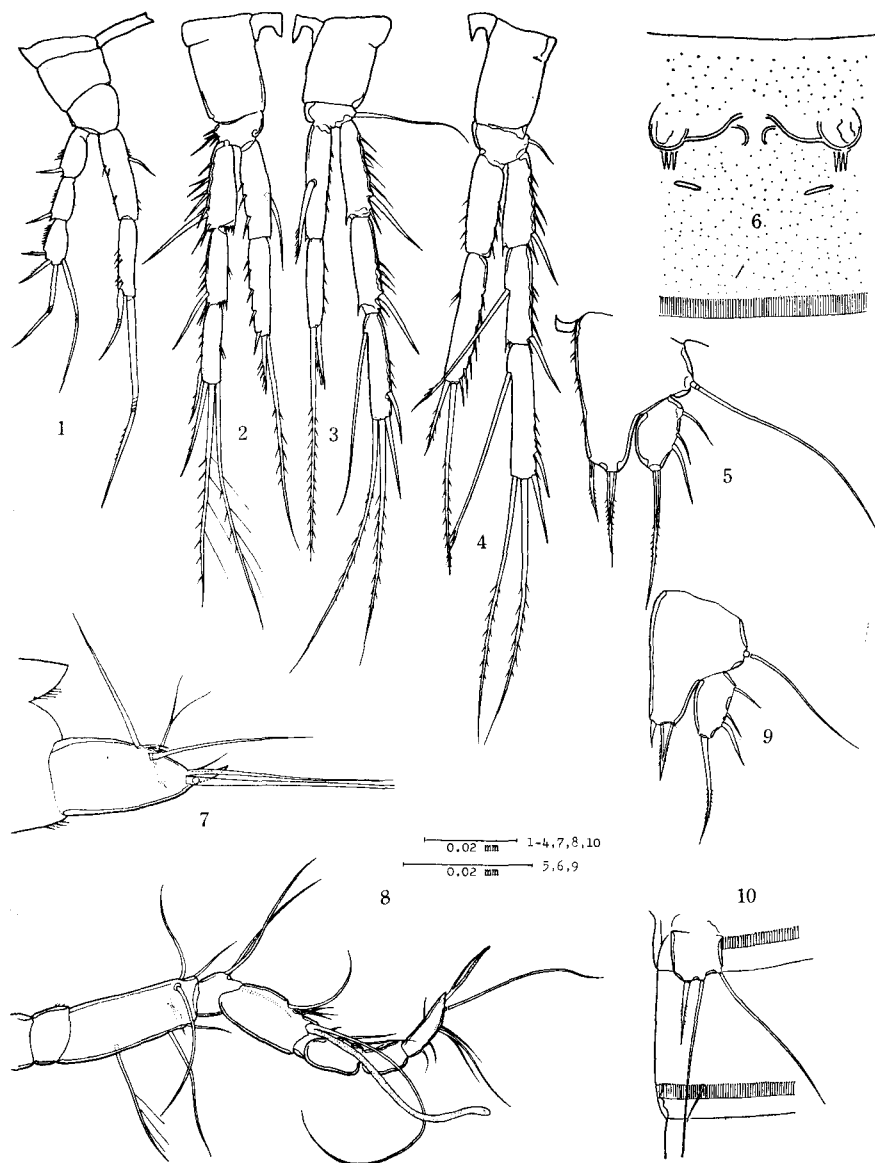


Fig. 12. *Paraleptastacus unisetosus* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4; 5. ♀, leg 5; 6. ♀, genital area; 7. ♀, anal segment and furcal ramus, lateral; 8. ♂, antennule; 9. ♂, leg 5. 10. ♂, leg 6.

Basis cylindrical, with a pair of three juxtaposed setae on and near distal end; apical half of ventral edge spinulose, three and two juxtaposed setae on subproximal dorsal edge. *Maxilla* (Fig. 11-7). *Syncoxa* a little tapering distally, with two endites, proximal one of which furnished with three spinulose short setae apically and distal one with one pectinate spine accompanied with one bare seta basally, and one hairy seta subdistally. Basis forming into a strong claw at inner part, with one bare seta laterally. Exopodite represented by a cylindrical projection with four setae, one terminally, two on subdistal outer edge and shortest one on about middle outer edge. Endopodite represented by one bare seta on small protuberance of basis. *Maxillipede* (Fig. 11-8). Coxa short. Basis bare and about three times as long as coxa. Endopodite represented by a small segment with one long pectinate seta on distal end and one slender bare seta on outer distal corner.

Leg 1 (Fig. 12-1). Intercoxal plate remarkably wide. Coxa subdivided into two parts transversely, bare. Basis shorter than coxa (without outer seta?). Exopodite three-segmented, each segment of equal length; first two segments, each with one outer spine and several spinules along outer margin; third one with two hairy outer spines subdistally, two geniculate long spines, each on distal end and inner subdistal corner, and with several spinules along outer margin. Endopodite a little longer than exopodite, two-segmented; first segment a little longer and wider than second, with one inner seta on about a third the length of inner edge, and with several spinules on and near both margins; second one with two geniculate spines, shorter one on outer subdistal corner and about as long as second segment, and another one on distal end, and much longer than two endopodite-segments combined; two oblique spinular rows, each consisting of several slender spinules, along outer margin. *Leg 2* (Fig. 12-2). Free edge of intercoxal plate concave. Coxa rectangular in shape, about 1.5 times as long as greatest width. Basis small, with one bare outer seta accompanied with several spinules basally. Segmentation in both rami as in those of preceding leg. Exopodite; first two segments, each with one outer spine subdistally, spinulose along outer margin and on inner distal corner; several juxtaposed spinules on middle inner edge of each second and third segment; third one with one subdistal outer spine, and three terminal setae, outermost one of which shortest and spiniform and other two spinulose outwards and hairy inwards. Endopodite a little shorter than exopodite; both segments of equal length and spinulose along outer margin; first segment with one seta on middle inner edge; second one with one spine, which spinulose only outwards, and one spinulose seta on distal end. *Leg 3* (Fig. 12-3). Free edge of intercoxal plate deeply concave. Coxa almost as in preceding leg. Basis furnished with one long outer seta, without any spinules. First two exopodite-segments ornamented almost as in preceding leg, but middle inner edge of second one without spinule; third one furnished with one inner seta subproximally. Endopodite about as long as first two exopodite-segments combined, ornamented as in preceding leg except for smaller spinules along outer margin; second segment a little shorter than first. *Leg 4* (Fig. 12-4). Coxa a little longer than that of

preceding leg. Outer seta of basis rather short. Exopodite; first segment ornamented as in the preceding leg; second one furnished with one inner seta modified apically on middle edge; third one much longer than second, with one inner seta (not two inner setae) modified as that of preceding segment, on subproximal edge. First endopodite-segment shorter than second, without inner seta and inner margin somewhat spinulose; second one about as long as third exopodite-segment, with two spinulose terminal setae and several minute spinules on about a third the length of inner margin. *Leg 5* (Fig. 12-5). Intercoxal plate small. Basoendopodite about 1.4 times as long as basal width, with several minute spinules along rather straight inner margin, two hairy setae, shorter one on subdistal inner edge and another on distal end of inner expansion; outer seta remarkably long and bare, geniculate basally. Exopodite somewhat oval in shape, reaching to distal end of inner expansion; inner margin slightly rounded and bare; one thick hairy seta on distal end and three short bare setae along outer edge, first two widely separated from each other. *Leg 6* (Fig. 12-6) represented by three parallel spinules attaching on outer part of genital area.

Male. Body a little smaller than in female.

Antennule (Fig. 12-8) haplocer, eight-segmented; first segment with several hairs or spinules on anterior edge; a seta near middle posterior edge of second segment distinctly with several long hairs; last segment attenuated distally, with one small aesthetasc. *Leg 5* (Fig. 12-9). Apical two setae on inner expansion of basoendopodite much shortened, and stumpy in appearance. *Leg 6* (Fig. 12-10) represented by a square plate with three setae on a minute lobule in each, innermost one short and hairy, other two bare and well-developed, reaching to second abdominal segment.

Remarks. The most species of the genus *Paraleptastacus* have two inner setae on the third exopodite-segment of leg 4. Contrary to these, two species as well as the present new one described have one inner seta on the segment; the two are *P. incertus* Chappuis (1957) from Bahamas and *P. ammodytensis* Carvalho (1951) from Santos, Brazil. The present species is quite different from *P. incertus* which has such noticeably unique structure as the three-segmented endopodite of leg 1. It is rather dubious that *P. ammodytensis* has the distinctive structures described and illustrated by Carvalho. If accepted his brief description and figures, the species is quite distinct from the present one in the following structures; each first endopodite-segment of first three legs without inner seta; the second exopodite-segment of leg 3 with one short inner seta instead of the usual seta on subproximal inner edge of the third segment; the second exopodite-segment of leg 4 with one short inner seta on distal corner instead of the usual long seta situated at middle inner edge. Wilson (1935) reported on the different structure of the leg 2, leg 3 and leg 4 in both sexes in *P. brevicaudatus*. Although distinct sexual dimorphism in the thoracic legs except for the leg 5 has been reported also by several authors besides Wilson, there is no noticeable difference in such legs between both sexes in the present materials. The hairy seta on the second

antennular segment in the male is found also in *P. longicaudatus* Nicholls (1940) from St. Lawrence, Canada.

Type-specimens. Syntypes, 3 ♀♀ and 2 ♂♂, 13-V-'71. All the specimens were collected from intertidal zone of the sandy beach at Hakodate. Several individuals of the species were also collected from the sandy beach of Ishikari. In Ishikari the species was found only in late winter or early spring (11-IV-'69, 25-II-'70).

***Stenocaris intermedia* n. sp.**

(Figs. 13-16)

Female. Body (Figs. 13-1, 13-2) cylindrical, 1.2 mm in length, rostrum included and accessory of furcal ramus excluded, and 0.1 mm in width; almost colourless and semitransparent; all somites more or less granulated on surface. Nauplius eye wanting. Hyaline frill of all somites rather modest particularly in thorax. Cephalic segment about as long as succeeding two somites combined,

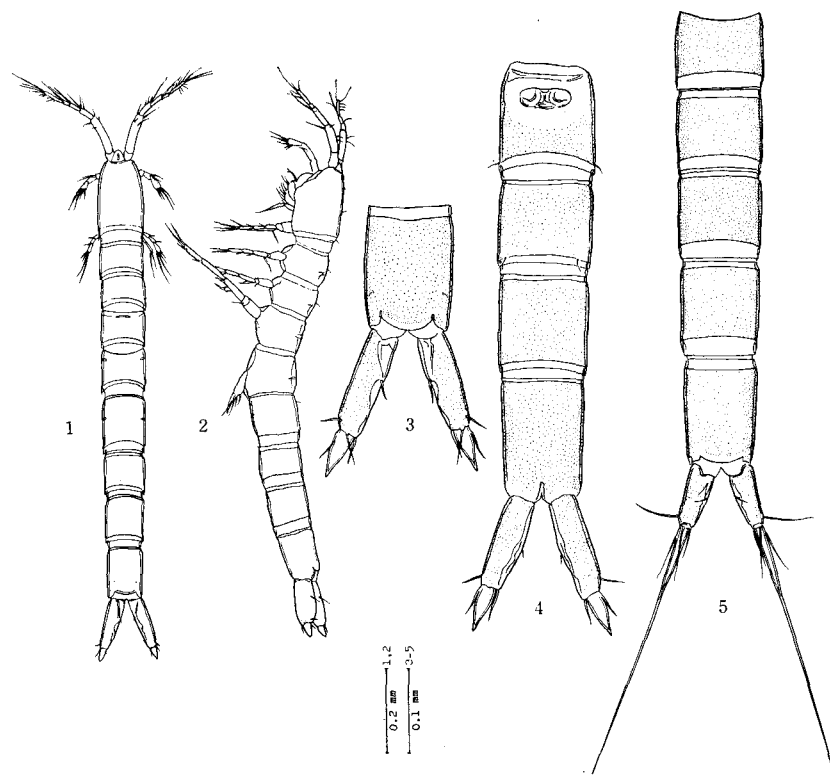


Fig. 13. *Stenocaris intermedia* n. sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, anal segment and furcal rami, dorsal; 4. ♀, abdomen, ventral; 5. ♂, abdomen, dorsal.



Fig. 14. *Stenocaris intermedia* n. sp. 1. ♀, antennule; 2. ♀, antenna; 3 a and b. ♀, mandible; 4. ♀, maxillula; 5. ♀, maxilla; 6. ♀, maxillipede.

scattering several delicate sensory hairs dorsally. Rostrum well defined at base, triangular in shape and slightly rounded apically. Genital double-somite (Fig. 13-4) with no trace of subdivision, with a delicate sensory seta on each posterior ventro-lateral edge. Anal segment a little longer than previous segment, with a pair of sensory setae subdorsally. Anal operculum (Fig. 13-3) moderately rounded, without any setae or spinules, somewhat hyaline along free edge. Furcal ramus (Fig. 13-4) elongate cylindrical in shape, about three times as long as greatest width; outer edge smooth and with one bare short seta on subproximal corner; inner edge rather rough, with one bare setula midst; posterior end furnished with one short bulbiform process with a delicate accessory seta (the bulbiform process is corresponding with so called principal terminal seta) on outer proximal edge, one short seta both dorsally and inwards near base of process.

Antennule (Fig. 14-1) a little longer than cephalic segment, six-segmented; first segment small, with one bare seta accompanied with several minute spinules basally on distal edge; second one longest, four times as long as greatest width,

furnished with several setae on distal half; posterior edge of third one bare; fourth one furnished with one aesthetasc a little longer than second one; fifth one smallest; sixth one much elongated, about twice as long as fourth, with one trifurcate terminal seta, one of furcations aesthetasc-like and about as long as segment. *Antenna* (Fig. 14-2). Coxa small, much shorter than width and bare. Allobasis about three times as long as greatest width; anterior edge thickly chitinous. Exopodite cylindrical, one-segmented; two bare setae of equal length on distal end. Endopodite a little shorter than allobasis, widened distally; two separate spines on anterior edge which with several spinules both subproximally and subdistally; distal end with three geniculate long spines, two smooth spines and one setula on posterior corner; subdistal posterior edge with several slender spinules; a longitudinal row of some delicate spinules near subdistal edge. *Mandible* (Figs. 14-3a, b). Praecoxa well-developed, with bidentate pars incisiva, tridentate lacinia mobilis, two spines, ventral one serrate apically and another sharpened, and one long hairy seta on dorsal inner corner. Palp cylindrical, two-segmented; first segment about six times as long as greatest width, furnished with one bare seta on inner subdistal corner; second one much shorter than first, somewhat inclined outwards, with one inner seta on subdistal edge and a pair of two juxtaposed terminal setae, each widely separated. *Maxillula* (Fig. 14-4). Praecoxa thickly chitinous along outer edge; arthrite with two parallel setae on surface, seven claws or spines along inner edge, each shortened dorsally, and two hairy short setae on dorsal corner. Coxa furnished with one strong claw, which spinulose on subdistal dorsal edge, and one spiniform seta on inner terminal end. Basis slightly tapering inwards, furnished with one spinulose claw accompanied with five slender setae basally, and spinulose on and near subdistal dorsal edge. Exopodite and endopodite represented by three and two slender setae respectively. *Maxilla* (Fig. 14-5). Syncoxa thickly chitinous at outer edge, with two well-developed cylindrical endites, each furnished with three spinulose setae or spines terminally. Basis forming into a strong claw which acutely bending dorsally at apical part with several delicate spinules dorsally, and with two bare setae, each on dorsally and laterally at base of claw. Endopodite represented by four juxtaposed setae, all bare and slender. *Maxillipede* (Fig. 14-6). Coxa slightly thickened distally, with one hairy seta on distal end. Basis bare, longer than coxa, about three times as long as greatest width. Endopodite-segment very short and furnished with one slender terminal claw which much longer than basis, swollen basally and geniculate at hairy middle part.

Leg 1 (Fig. 15-1). Intercoxal plate remarkably wide, and free edge rather straight. Coxa densely granulated, produced inwards. Basis much shorter than coxa, with one slender spiniform spine on inner distal corner, outer edge not ornamented. Exopodite three-segmented; first two segments of equal length with one spine on each outer distal corner; third one a little shorter than preceding ones, with two outer spines near distal end, two geniculate long spines, shorter one terminally and another on inner subdistal corner and much longer than three

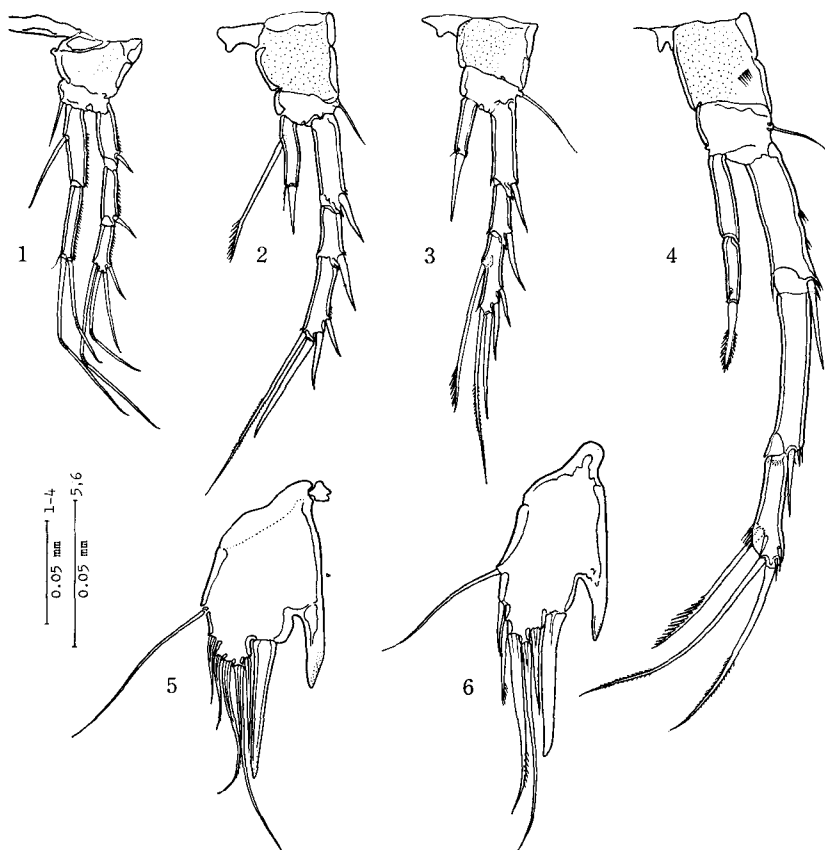


Fig. 15. *Stenocaris intermedia* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4, 5. ♀, leg 5. 6. ♀, leg 5 in another specimen, obliquely lateral.

exopodite-segments combined. Endopodite about as long as exopodite, equally two-segmented; first segment with one hairy seta on about middle inner edge; second one a little slighter than first, with two long geniculate spines, inner one of which longer than outer, and a setula on inner distal corner. All segments of both rami spinulose along each outer margin. *Leg 2* (Fig. 15-2). Free edge of intercoxal plate slightly concave. Chitinous outer rim of coxa separated into two parts by a small pit. Basis with one bare seta on a small outer projection. Segmentation of exopodite as in previous leg; first segment about twice as long as second, both segments with one outer spine, accompanied with several spinules basally, on each subdistal edge; third one about 1.5 times as long as second, with one long spine on distal end and one hairy seta on inner distal corner, and spinulose along middle outer margin. Endopodite one-

segmented, shorter and much slender than first exopodite-segment, a little bending outwards, furnished with one straight spine accompanied with a setula on distal end, and one thick seta, pectinate apically, near inner subproximal edge. *Leg 3* (Fig. 15-3) slightly smaller than leg 2. Coxa a little shorter than preceding leg. First two segments of exopodite ornamented almost as in leg 2; third one furnished with one thick inner seta, pectinate apically, near subproximal inner edge. Endopodite one-segmented, shorter than first exopodite-segment, with one strong straight spine terminally and one setula near inner subdistal corner. *Leg 4* (Fig. 15-4) strikingly developed. Intercoxal plate small. Coxa a little longer than width, with an oblique spinular row on anterior surface near outer middle edge. Exopodite three-segmented; first segment thickest, with two groups of several spinules about middle outer edge and one outer spine accompanied with some spinules basally; second one slighter than first and as long as first, with one outer spine; first two segments forming into a hyaline serrate plate near distal end; third one much shorter than second, and thickened distally, with two small outer spines near subdistal corner, two hairy thick setae, each on distal end and on inner subdistal corner, and one pectinate inner seta, accompanied with some spinules basally and covered with a hyaline formation just inside of subdistal edge. Endopodite two-segmented, both segments combined about as long as first exopodite-segment; first one entirely bare; second one a little shorter than first, furnished with one thick terminal claw pectinate along both sides, and one setula near inner subdistal edge. *Leg 5* (Fig. 15-5) very similar to that of *S. gracilis* Sars, represented by one robust plate which forming into a strong spur at inner part; one long claw at middle edge between distal end with one long bare seta and spur; one spine on subdistal outer edge; outer edge with four setae in total, proximalmost one slender, succeeding two much shorter and distalmost one thickest and spinulose along apical part.

Male. Body a little shorter and more slender than in female, 1.1 mm in length. Furcal ramus strikingly different from that of female in ornamentation; outer and dorsal setae much elongated; terminal seta well-developed, much longer than last two abdominal somites combined, moderately thickened at basal part which about as long as furcal ramus.

Antennule (Fig. 16-1) haplocer; first segment ornamented as in female; second one elongated and setigerous at distal half; apical one much shorter than in female.

Leg 1 and *leg 4* same as in female. *Leg 2* (Fig. 16-2). Free edge of intercoxal plate rather straight. Basis forming into a sharp spur at each inner distal corner. First two segments of exopodite almost same as in female; third one much elongated, a little longer than proximal two segments combined, hairy along middle part of outer margin, three outer spines on subdistal edge, one strong terminal claw which furnished with a twisted apical accessory and one or two spinules on middle inner edge; inner margin slightly waved. Endopodite two-segmented equally; first segment with one inner seta pectinate apically; second one slightly tapering distally and terminating in one short hairy spine. *Leg 3* (Fig. 16-

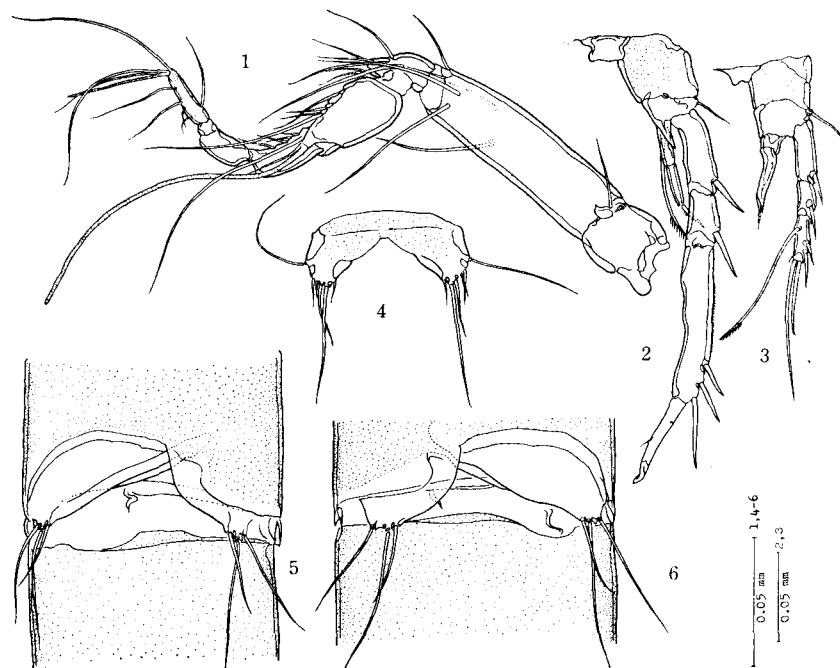


Fig. 16. *Stenocaris intermedia* n. sp. 1. ♂, antennule; 2. ♂, leg 2; 3. ♂, leg 3; 4. ♂, leg 5; 5. ♂, leg 6; 6. ♂, leg 6 in another specimen.

3) rather small. Outer seta of basis somewhat hairy. Exopodite ornamented as in female. Endopodite two-segmented; first segment distinctly shorter and bare; second one about four times as long as first, and acutely tapering distally from subdistal outer edge with an accessory process. *Leg 5* (Fig. 16-4). A pair of legs represented by a broad lamella; middle distal part widely incurved; a setula on inner subdistal corner, one long seta terminally, three rather short setae along outer subdistal edge, and one long seta, articulate basally, on middle outer edge. *Leg 6* (Fig. 16-5). Both legs asymmetrical in shape, each with three bare setae on outer part.

Variability. No marked variation is noticed in the size and the ornamentation of all appendages except for the leg 6 in one male which has a distinct asymmetrical structure (Fig. 16-6).

Remarks. The present species seems to occupy the intermediate situation between *S. minor* (T. Scott, 1892) and *S. gracilis* Sars (1909), because the present species resembles the former species in the ornamentation of furcal ramus which is sexually dimorphic, and on the contrary is remarkably close to the latter in the characteristic structure of leg 5 in the female.

The six-segmented antennule in the female is also known in the following

species; *S. gracilis* Sars, *S. minuta* Nicholls (1935), *S. pontica* Chappuis et Serban (1953), *S. pygmaea* Noodt (1955) and *S. pristina* Wells (1968). Within the four species it is reliable that the three species, *S. minuta*, *S. pygmaea* and *S. pristina*, have the elongate apical segment of antennule in the female as in the present one. None of them, however, have the peculiar bulbiform process on the furcal ramus as in the present species.

Type-specimens. Syntypes. 3 ♀♀ and 4 ♂♂, 12-VII-'71. All the specimens were collected from the intertidal zone of sandy beach consisting of rather coarse sands and pebbles, on the promontory of Aikappu, Akkeshi.

***Arenosetella bidenta* n. sp.**

(Figs. 17-18)

Female. Body (Figs. 17-1, 17-2) cylindrical, 0.52 mm in length, rostrum included and furcal setae excluded, slightly tapering posteriorly at abdomen, uncoloured and semitransparent. Each somite, last two excluded, furnished with a hyaline frill, those of third free thoracic somite and three succeeding ones (Fig. 17-5) remarkably narrower than others. Lateral edge of each carapace in three free thoracic segments distinctly extended ventrally (it is so transparent that the basal part of each leg is well observable in lateral view). Cephalic segment a little longer than two succeeding somites combined; anterior free edge densely spinulose (Fig. 17-7). Nauplius eye wanting. Rostrum (Fig. 17-7) well-developed, defined at base, and reaching to distal end of third antennular segment. Each four thoracic segments with a transverse row of minute spinules on dorsal surface. Genital double-somite (Fig. 17-3) with no trace of subdivision; a sensory hair on each dorso-lateral surface; four transverse spinular rows on surface near anterior edge; genital area as shown in the figure (Fig. 17-6). Antepenultimate somite with two transverse spinular rows. Penultimate somite; middle dorsal edge of hyaline membrane forming into a small protuberance (which is probably identical with the so called pseudoperculum and is so thin and transparent that it is very difficult to detect); a peculiar chitinous structure (Fig. 17-4) under pseudoperculum. Anal segment about half as long as preceding somite, furnished with a pair of bifid mucroniform processes on middle dorsal surface (Fig. 17-3). Furcal ramus about as long as width, a little tapering distally, with one straight spine and one bare seta on inner dorsal corner near distal end, principal terminal setae well-developed, longer one more than 0.3 mm in length; one slender seta accompanied with a hair basally, on outer distal corner; one rather short seta on outer subdistal edge.

Antennule (Figs. 17-7, 17-8) six-segmented; first segment with one hairy thick seta on inner distal corner; second one about as long as first, remarkably setigerous; third one with one aesthetasc which extending to last segment; fifth one longest; last one a little shorter than preceding, with one trifurcate seta, one of furcations aesthetasc-like and about as long as four apical segments combined.

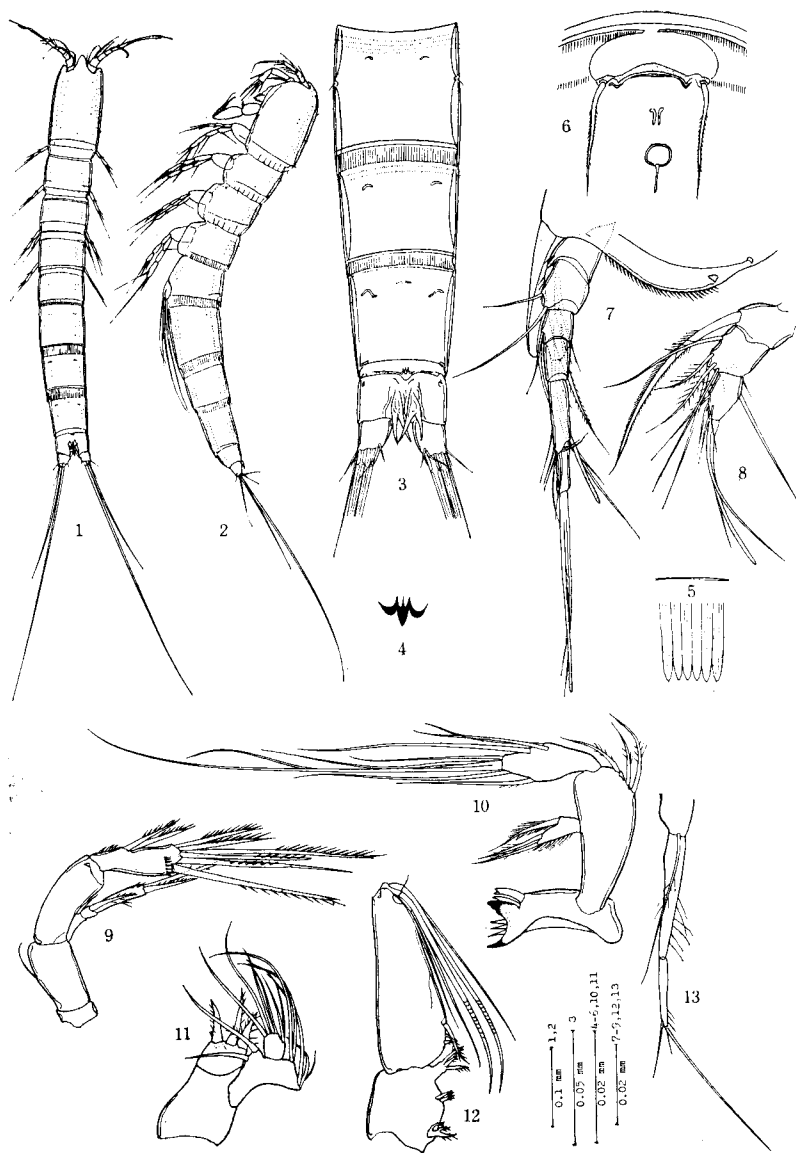


Fig. 17. *Arenosetella bidenta* n. sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, abdomen, dorsal; 4. ♀, a chitinous formation on penultimate somite; 5. ♀, hyaline frill of genital double-somite; 6. ♀, genital area; 7. ♀, rostrum and antennule; 8. ♀, first three segments of antennule; 9. ♀, antenna; 10. ♀, mandible; 11. ♀, maxillula; 12. ♀, maxilla; 13. ♀, maxillipede.

Antenna (Fig. 17-9). Coxa very short, bare. Basis a little widened distally, with a slender seta on middle anterior edge. Exopodite longer than first endopodite-segment, three-segmented; first two segments with one spine on each distal corner; second one shortest; third one with two spinulose terminal spines and several spinules on middle edge and subdistally. Endopodite two-segmented, first segment longer than second and without any spinules or spines; second one thickened distally with two spinulose juxtaposed spines on middle anterior edge; six spinulose spines on distal end; several spinules along anterior proximal edge and on subproximal edge transversely. *Mandible* (Fig. 17-10). Praecoxa forming into a thickly chitinous bifid claw with three spines on middle edge, and with two claws on subdistal corner. Coxa-basis remarkably widened distally, with three spinulose setae. Exopodite represented by a small segment which hairy along outer margin, with one terminal and two marginal hairy setae. Endopodite rather oval in shape, with one and three juxtaposed setae terminally, two widely separate setae on outer edge, and three setae on inner edge. *Maxillula* (Fig. 17-11). Arthrite of praecoxa with three spinulose thick setae along inner edge and two setae or spinules near inner dorsal corner. Coxa with two and three juxtaposed setae terminally. Endopodite rather quadrangular in shape, with four terminal and two juxtaposed inner setae. Exopodite represented by a small protuberance with two thick setae. *Maxilla* (Fig. 17-21). Syncoxa about as long as greatest width, with three endites; each with three, two and three hairy setae, counting distally. Basis more than twice as long as syncoxa, widened subproximally and tapering distally; outer margin rather straight; inner subproximal edge with three setae, distalmost one inclined rather proximally. Endopodite represented by two geniculate and three slender setae and a hair. *Maxillipede* (Fig. 17-13). Coxa thickest, with one long hairy seta terminally. Basis about six times as long as greatest width; distal half of inner margin sparsely hairy. Endopodite about half as long as basis, a little tapering at distal half; one long terminal seta accompanied with a setula or hair, and one slender seta on subdistal edge.

Leg 1 (Fig. 18-1). Free edge of intercoxal plate deeply concave. Coxa produced distally at outer part, with two arched spinular rows near outer subdistal edge and on middle distal surface. Basis furnished with one thick seta on anterior surface near inner edge; several spinules on outer edge. Exopodite about as long as first two endopodite-segments combined, three-segmented; first segment with one outer spine; second one a little more slender than first, and with one outer spine and one inner seta on about middle edge; third one longer than other two, with two outer and two terminal spines, inner terminal one of which hairy along inner margin, and one hairy inner seta on subproximal edge; outer margin of each segment spinulose. Endopodite tapering distally, three-segmented; first segment with one hairy thick seta on a third the length of inner edge, two arched spinular rows near outer edge; second one much shorter than first, furnished with a strong claw on outer distal corner, one thick inner seta on subdistal edge and several



Fig. 18. *Arenosetella bidenta* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4; 5. ♀, leg 5.

spinules near distal inner corner; third one longest, with one outer spine on subdistal edge, one spine and one long spiniform seta on distal end, and one thick inner seta on middle edge; outer margin of each segment densely spinulose. *Leg 2* (Fig. 18-2). Coxa with one arched spinular row near outer distal corner. Basis with one outer setula accompanied with several spinules basally. Exopodite ornamented as in leg 1 except for one inner seta on first segment. Second endopodite-segment with one reflexed seta just outside of inner seta; outer distal claw rather moderate. *Leg 3* (Fig. 18-3). Coxa ornamented as in leg 2. Outer seta of basis longer than in leg 2 and with no spinule at base. Apical part of inner seta on second exopodite-segment exactly modified. Endopodite almost as in leg 2. *Leg 4* (Fig. 18-4). Coxa slightly reduced in width. Basis with several spinules on outer edge (outer seta absent?). First two segments of exopodite ornamented as in leg 3; third one with two slender setae on proximal half of inner edge. First and third segments of endopodite as in leg 2 and leg 3;

second one with only one inner seta (reflexed seta absent exactly). *Leg 5* (Fig. 18-5). Basoendopodite with one bare outer seta; inner expansion reaching to middle of exopodite, with two hairy setae, inner one much longer than outer and deeply inserted basally. Exopodite completely fused to basoendopodite, bilobate distally; inner lobe with two long setae, inner one longest and reaching to posterior end of antepenultimate somite; outer lobe with one long seta; one bare seta on surface near presumable base of the exopodite-segment.

Remarks. The present species is closely allied to *A. germanica* Kunz (1937) from Kieler Förde in the bifid process of anal segment, but is easily distinguishable from the latter in the setal structure of certain thoracic legs. Although *A. germanica* was also reported by Rouch (1962) and Chappuis (1954) from Brazil and Madagascar respectively, Lang (1965) has recently treated the species from Brazil and Madagascar to be distinct from *A. germanica* and renamed them as follows; for the former *A. rouchi* and for the latter *A. madagascariensis*. The distinctive setal ornamentation in the certain legs among the four species described is summarized in the following table.

Table 2. The setal ornamentation in the four species of *Arenosetella*.

	Inner edge of 3rd exop. leg 3	2nd endop. leg 4	3rd exop. leg 4
<i>A. germanica</i>	2	2	2
<i>A. rouchi</i>	1	2	2
<i>A. madagascariensis</i>	1	2	1
<i>A. bidenta</i> n. sp.	1	1	2

As shown in the table the present species differs from all other species described in the setal number of the second endopodite-segment of leg 4. Further it is noticeable that the furcal ramus in the present species is exactly furnished with one spine near inner distal corner. Such furcal spine is not observed in the three species described, even in the Lang's figure (Lang, 1965) of *A. germanica* which seems to be illustrated in full detail.

Type-specimens. Syntypes. 4 ♀♀, I-VII-'71. All the specimens were collected from intertidal zone of the sandy beach at Rumoi. The species was also scarcely found in the sandy beach at Ishikari.

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